Unit 4.5 - Counting Principles - Day 1
Section 8.6
Fundamental Counting Principle

FUNDAMENTAL COUNTING PRINCIPLE

If n independent events occur, with

m_1 ways for event 1 to occur.

m_2 ways for event 2 to occur.

.

.

.

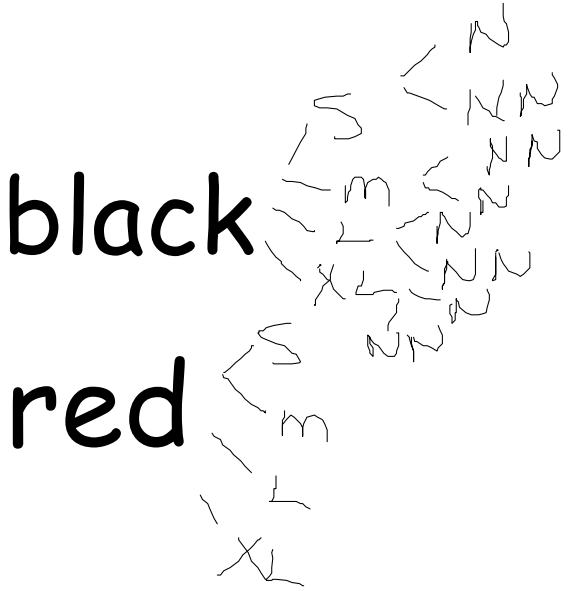
and m_n ways for event n to occur.

then there are $m_1 \cdot m_2 \cdot \ldots \cdot m_n$

different ways for all n events to occur.

Consider the following situation:

A cross-country team is selling hoodies. The team is offering RED or BLACK, in sizes SMALL, MEDIUM, LARGE and EXTRA LARGE. Additionally, students may choose to have their last name printed on the back. Determine how many choices they have.



$2 \cdot 4 \cdot 2$

Again consider the cross country example, but intead use the Fundamental Counting Principle:

color x size x name = total choices

2 x 4 x 2 = 16

Example 2

2012 Volkswagen Jetta

Color	Engine type	Transmission	Sound	Seats
red	gasoline	manual	Stereo	leather
gray	diesel	automatic	Stereo with cd	pleather
white			Stereo with cd and satellite	
brown			Stereo with cd, satellite and bluetooth	

How many choices of Jettas are there?

$4 \cdot 2 \cdot 2 \cdot 4 \cdot 2 = 128$ choices

Suppose a student id number consists of 6 digits and the first digit can not be 0. How many student numbers can be made?

$10^5 = 100{,}000$

$9 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 900{,}000$

Suppose a student id number consists of 6 digits and the first digit can not be 0. No digits may repeat. How many student numbers can be made?

$9 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 =$

$136{,}080$

Suppose a student id number consists of six digits. The first digit can not be 0 and all other digits must be even. How many arrangements are there?

$$\underline{9} \cdot \underline{5} \cdot \underline{5} \cdot \underline{5} \cdot \underline{5} \cdot \underline{5} = 28{,}125$$

Now, suppose the first digit still can not be 0 but there are no repeats allowed in the last five digits.

$$\underline{9} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1} = 1080$$

Homework

Counting Principles
Day 1
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